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8/12/98
Date By

Ref Ltr #

DOE ORDER # 5400.1

Mr Joe Schieffelin
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530

Ms. Susan Chaki
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530

Dear Mr Schieffelin and Ms Chaki

Enclosed please find two copies of the *Final Sampling and Analysis Plan for the Hydrogeologic Characterization of Individual Hazardous Substance Sites (IHSSs) 121 and 148 at Building 123,* Revision 0, July 1998. This Sampling and Analysis Plan provides for a hydrogeologic investigation of Building 123 in support of post-demolition hazardous and radiological site characterization activities required for IHSSs 121 and 148 and Potential Areas of Contamination This revision has incorporated comments from the Environmental Protection Agency and the Colorado Department of Public Health and Environment The U S Department of Energy Rocky Flats Field Office requires your approval of this document by August 24, 1998

If you should have any technical questions regarding this transmittal, please contact Norma I Castaneda at 303-966-4226 or contact me at 303-966-7252

Sincerely,

R R Sarter
RFCA Project Coordinator

Enclosures

AUG 1998

ADMIN RECORD

IA-B123-A-00094

RF/RMRS-98-246

Sampling and Analysis Plan for the Hydrogeologic Characterization of Individual Hazardous Substance Sites (IHSSs) 121 and 148 at Building 123

Final

July 1998
Revision 0

SAMPLING AND ANALYSIS PLAN
FOR THE
HYDROGEOLOGIC CHARACTERIZATION
OF INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSSs)
121 AND 148
AT BUILDING 123

RF/RMRS-98-246

Revision 0

July 20, 1998

This Sampling and Analysis Plan has been reviewed and approved by

S H Singer, RMRS Project Manager	7/17/98 Date
G D DiGregorio, RMRS Quality Assurance	7 17 98 Date
Michalene Rodriguez, Radiological Engineering	7/16/98 Date

Prepared by
Rocky Mountain Remediation Services, L L C
Rocky Flats Environmental Technology Site
Golden, Colorado

DOCUMENT CLASSIFICATION
REVIEW WAIVER PER
CLASSIFICATION OFFICE

TABLES

FIGURES

ACRONYMS (cont'd)

PAM	Proposed Action Memorandum
PARCC	precision accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PID	Photoionization detector
PPE	Personal protective equipment
Pu	plutonium
QA/QC	Quality Assurance/Quality Control
QAPD	Quality Assurance Program Description
RCRA	Resource Conservation and Recovery Act
SWD	Soil and Water Database
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RMRS	Rocky Mountain Remediation Services, L L C
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SOPs	Standard Operating Procedures
TAL	Target Analyte List
TCFM	trichlorofluoromethane
TCL	Target Compound List
TOC	total organic carbon
TSDF	treatment, storage, and disposal facility
U	uranium
UBC	under building contamination
VOC	volatile organic compound

3-PRO-140RSP-09 03	*Radiological Characterization of Bulk or Volume Solid Materials*
RM-06 02	*Records Identification, Generation and Transmittal*
RM-06 04	*Administrative Record Document Identification and Transmittal*

project All work will be performed in accordance with the RMRS Quality Assurance Program Description (QAPD) (RMRS, 1997b)

1 2 Background

[Note Section 1 2 is provided, with minor modifications, from RMRS (1997d)]

Building 123 is located on Central Avenue between Third and Fourth Streets at the Rocky Flats Environmental Technology Site (Figure 1-1) The Building 123 area encompasses overlapping IHSSs 121 and 148 and a portion of RCRA Unit 40 (Figure 1-2)

Four (4) associated Potential Areas of Contamination (PACs), 100-601, 100-602, 100-603, and 100-611 have been identified in the RFETS *Historical Release Report* (HRR) (DOE 1992c), as shown in Figure 1-2 The PACs were established as the result of documented spill incidents

Unconfirmed reports of contaminant spills have been indicated in interviews with building employees In the late 1960's or early 1970's a cesium-contaminated liquid was spilled on the concrete floor in Room 109C (Figure 1-2) The floor was immediately sealed to immobilize the contamination No further action was initiated to address consequences of the spill During demolition, additional radionuclide hot spots were detected during radiological surveys of Rooms 103/105, 111, and 123/124

1 2 1 IHSS 121

IHSS 121 consists of RCRA Unit 40 underground Original Process Waste Lines (OPWLs) P-1, P-2, and P-3, which were designated in the *Final Phase I RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan For Operable Unit 9* (DOE 1992a) The area has also been identified as PAC 000-121 in the HRR (DOE, 1992c) The OPWL system constitutes former Operable Unit No 9 (OU 9) and RCRA Unit 40, the plant-wide process waste system comprised of tank and underground pipelines constructed to transport and temporarily store process wastes from point of origin to on-site treatment and discharge points

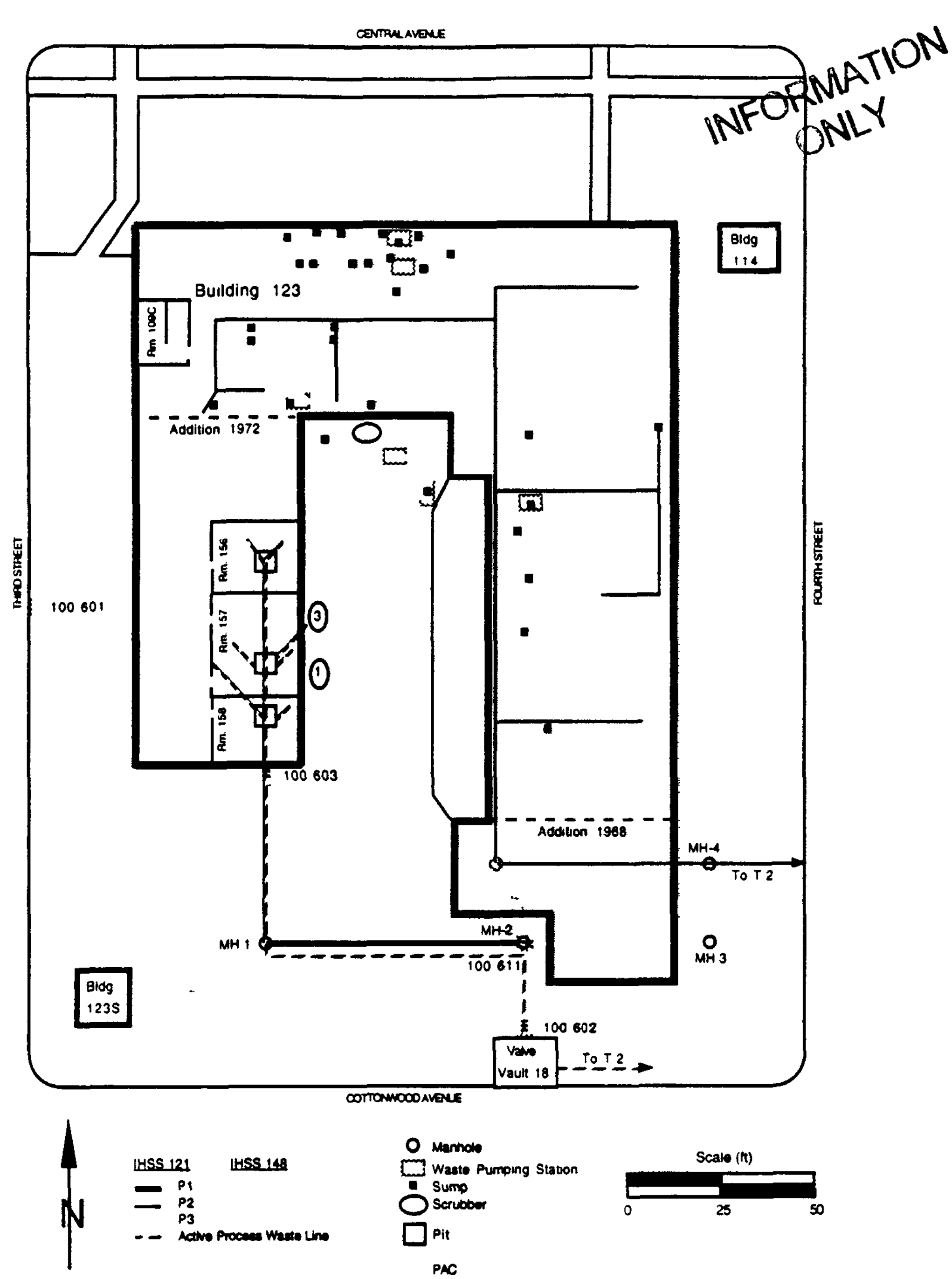


Figure 1-2 Location of Building 123 and Associated IHSSs 121 and 148

treatment (Figure 1-2)

1 2 2 IHSS 148

A detailed characterization of former Operable Unit No 13 (OU 13) was conducted from September 1993 to February 1995 as part of a Phase I RCRA RFI/RI (DOE, 1995) The characterization included high-purity germanium (HPGe) surveys, vertical soil profiles, surface soil sampling and soil gas surveys The investigation identified an area of reported small spills of nitrate-bearing wastes along the east side of Building 123 and a potential for soil contamination beneath the building due to possible leaks in OPWL P-2 The area was established as IHSS 148 and detailed in the *Final Phase I RFI/RI Work Plan for Operable Unit 13* (DOE 1992b) The area has also been identified as Under Building Contamination (UBC) 123 and PAC 100-148 in the HRR

Thirty-four (34) analytes were detected in the surface soil survey, including twenty-six (26) inorganic compounds and eight (8) radionuclides Eleven (11) analytes exceeded background limits at a minimum of one sample location throughout IHSS 148 Constituents that exceeded minimum detection levels or activities are indicated in Table 1-1

Table 1-1 Constituents Detected above Minimum Detection Levels or Activities in Soil Samples Collected during Surface Soil Survey at IHSS 148

Constituents Detected Above Minimum Detection Levels or Activities	Maximum Concentration	Background Limits[a]	Tier II Soil Action Levels[b]
Chromium	95 6 mg/kg[c]	24 9 mg/kg[c]	4860 mg/kg[d]
Cobalt	28 7 mg/kg	24 8 mg/kg	123,000 mg/kg
Copper	43 4 mg/kg	27 3 mg/kg	81,800 mg/kg
Lead	165 mg kg	61 4 mg/kg	1000 mg/kg
Nickel	52 4 mg/kg	26 8 mg/kg	40,900 mg/kg
Strontium	94 7 mg/kg	90 1 mg/kg	>1,000,000 mg/kg
Zinc	1,220 mg/kg	86 6 mg/kg	>1,000,000 mg/kg
Americium-241	0 197 ± 0 032 pCi/g	0 0227 pCi/g	38 pCi/g
Plutonium-239/240	0 169 ± 0 04 pCi/g	0 066 pCi/g	252 pCi/g

1 2 4 Potential Areas of Contamination (PACs)

PACs 100-601, 100-602, 100-603, and 100-611 were identified in the HRR, and involve potential impact to the soils surrounding Building 123 All of the four (4) PACs are located in Figure 1-2 The following outlines the nature of each PAC by describing the occurrence, constituents released, and response to the occurrence

PAC 100-601, Phosphoric Acid Spill

On April 13, 1989, two five (5)-gallon plastic containers of phosphoric acid, which were among other containers of waste chemicals awaiting disposal in a storage cabinet outside of Building 123, deteriorated and leaked a portion of the contents onto the paved ground surface Approximately one (1) gallon of 1,2 ethylhexyl phosphoric acid leaked from the containers At the time the release was detected, approximately eight ounces of the liquid were present on the ground within the vicinity of the cabinet The spill was contained and the remaining liquid was properly disposed No further action was required to address consequences of the spill

PAC 100-602, Process Waste Line Break

On April 13, 1989, Valve Vault 17, located on Cottonwood Avenue between Building 443 and 444, was found to be flooded with approximately 1,200 gallons of aqueous waste Subsequent investigation indicated that the source of the waste was a break in the active portion of P-1 in manhole MH-1 (Figure 1-2) Leakage from the break had migrated into bedding material surrounding the pipe and ultimately reached Valve Vault 17 through either pipe bedding materials (i e, soils) or a PVC electrical conduit The release also migrated into a section of the OPWL network Discharge of Building 123 process waste into the broken line was discontinued on April 18, 1989, five (5) days after the initial detection of release at Valve Vault 17 The potentially affected area includes the active process waste line between MH-2 and Valve Vault 18, the process waste line between Valve Vault 18 and Valve Vault 17, soils surrounding Valve Vault 18 and Valve Vault 17, and OPWL P-3 between MH-2 and MH-3 In July 1989, groundwater containing blue dye used several months earlier to trace the release was observed seeping into excavations around Valve Vault 18

The release consisted of bioassay waste containing hydrochloric acid and nitric acid The waste exhibited a pH of approximately 1 The waste may also have contained urine, and up to a combined total of 1 5 gallons of ammonium thiocyanate, ammonium iodide and ammonium hydroxide The estimated maximum volume of the spill was 30 gallons The released material commingled with rainwater in the excavation

Potential flow from the excavation was contained with earthen berms Approximately 100 gallons of rainwater contaminated by the spill were neutralized, pumped from the excavation, and transferred to the process system for treatment in Building 374 Samples were collected to evaluate the spread of contamination Results indicated that contamination was restricted to the excavation within eight (8) feet of Building 123 No further action has been initiated

<u>PAC 100-611, Building 123 Scrubber Solution Spill</u>

On November 7, 1989, an inoperative pump in the Building 123 process waste transfer system caused the Building 123 Scrubbers 1 and 3 to overflow, spill scrubbing solution into a bermed area outside of the building and into three sump pits in Rooms 156, 157, and 158 (Figure 1-2) All of the spilled solution was contained within secondary containment structures, and none of the solution was believed to have impacted the environment The pits were pumped out and the concrete liners properly sealed The transfer pump failure was determined to be the result of blockage caused by glass filtering wool

The scrubbing solution consisted primarily of water and was used to scrub acids and salts used in Building 123 Approximately fifty (50) gallons were released to the bermed area, and several hundred gallons were contained in the three sump pits Analysis indicated that the solution contained in the bermed area exhibited a pH of 1 6, the solution in the three pits indicated a pH of 6 0 All spilled materials were contained and transferred into the Building 123 process waste transfer for eventual treatment at Building 374 of Building 123 were constructed with foundation drains (Buildings 111, 129, 444, and 447) In general, the drains for these buildings have a small footprint and are not located immediately adjacent to Building 123 Building 460, located to the south, is notable because it was constructed 4 to 5 feet below grade (northeast corner near Building 123) and relies on a buried storm sewer system for drainage The west storm sewer line extends the entire length of the building in a north-south direction at an estimated depth of 4 to 5 feet Evidence of groundwater discharge to this line was observed on May 12, 1998, at two inlet grates located at the north and south ends of the west Building 460 sewer line At the north inlet grate, groundwater seepage was noted entering the concrete inlet structure along a seam at a depth of about 2 feet A continuous trickle of water was observed issuing from the pipe at the south inlet grate before joining with the east line and discharging to the Woman Creek drainage Additional discharge is assumed to occur through permeable bedding material that typically encloses underground lines A natural seepage area located due south of Building 664 also contributes to the drainage of the 400-complex area

Figure 1-4 illustrates a reinterpretation of second quarter 1996 potentiometric contours in the Building 123 area compared to RMRS (1997e, Plate 2) This reinterpretation accounts for the influence of building foundation drains and deeply buried storm sewer lines using floor and drain invert elevations provided in EG&G (1994), and inferred depths to water at wells 5071 and 5671 for 2nd quarter 1996 conditions Building 460, in conjunction with the storm sewer and foundation drains of other buildings in the 400-complex, appears to have slightly depressed the water table, which narrows the groundwater ridge and effectively causes the groundwater divide to shift about 200 feet northward from that originally depicted by RMRS (1997e, Plate 2) The effect of this depression is expected to be greatest during spring when water levels reach seasonal highs and interact more extensively with subsurface drainage structures Depression of the potentiometric configuration at the 400-complex is expected to result in a more eastward groundwater flow direction at Building 123 than shown in RMRS (1997e, Plate 2) Based on the available data, the potential for a southeast component of flow from Building 123 toward the 400-complex appears to be unlikely, at least for most of the year Temporary diversion of shallow groundwater flow may also occur along utility corridors (i e , water, sewer and storm drain systems) that traverse the area along the surrounding roadways at depths of up to 6 feet For example, the sanitary sewer system in the vicinity of Building 123 was identified as a probable area of sewer line infiltration during high groundwater level periods by EG&G (1994) monitoring wells installed at Building 123, however, water level measurements from additional wells in the southwest quadrant of the Industrial Area will be made to strengthen groundwater flow and quality interpretations

The following conditions were considered in the development of the sampling strategy

- The operating history of Building 123 suggests that volatile organic, metal, radionuclide, cyanide, and nitrate contaminants may have been released to the environment from surface and subsurface sources,
- The physical and chemical properties of the contaminants suggest a chronic presence if released into the environment,
- Historical data indicate the presence of contaminants in quantities above the maximum background concentrations defined by Site Procedure 3-PRO-140-RSP-09 03, *Radiological Characterization of Bulk or Volume Solid Materials* and the *Background Geochemical Characterization Report* (DOE 1993), and
- Subsurface industrial area structures and operations may cause local effects on groundwater flow direction and discharge that affect monitoring system design

The conceptual model of contaminant migration to groundwater involves percolation of liquids from surface soils and subsurface drains downward through the unsaturated zone to the water table and leaching of contaminants from subsurface waste lines during high water table periods After contaminants encounter the saturated zone, contaminant migration will proceed laterally and follow the principal direction of groundwater flow Groundwater at Building 123 is presumed to flow in an easterly to northeasterly direction Contaminant movement in the unsaturated and saturated zones may be retarded to various degrees by sorption, volatilization, or biodegradation, depending on the chemical behavior of the contaminant Contaminant concentrations may also be reduced by dispersion during migration Paved portions of the Building 123 area, which encircle much of the building to the surrounding streets, are expected to significantly impede contaminant migration from the surface, as most precipitation and surface runoff is diverted to the storm water drainage system instead of percolating through the ground surface (DOE 1992b)

3 3 Identify Inputs to the Decision

Inputs to the decision include radiochemical and chemical results from groundwater samples collected from newly-installed monitoring wells for comparison to RFCA Action Levels (DOE, 1997) The parameters of interest include the analyses outlined in Table 4-2

Further inputs to the decision include water level measurements from new and existing monitoring wells, which will be used to delineate groundwater flow directions for interpretation of groundwater analytical data Land surveying of new well casing locations (± 1 foot) and elevations (± 0 01 foot) will be conducted to provide control for potentiometric contouring

3 4 Define the Boundaries

The investigative boundaries and rationale are detailed in Section 4 of this SAP

3 5 Decision Rule

If the radiochemical activities or chemical concentrations in the groundwater exceed the RFCA groundwater action levels, an evaluation of potential impacts to surface water is required

3 6 Decision Limits

Decision on further investigation will be based on the results of the ER Ranking Additional characterization, if required, will be based upon an evaluation of data collected under this SAP Well locations are based on previous hydrogeologic investigations, current-day field observations, reinterpretation of groundwater flow directions, and the location of contaminant releases and OPWLs and RCRA process lines Groundwater monitoring will be performed in accordance with this SAP and the RFETS Integrated Monitoring Plan (DOE 1997)

	114	from IHSS 148 and 121
10498	Between Bldgs 123 and 441 at SE corner	Monitor groundwater quality downgradient from IHSSs 121 and 148, and PACs
10598	Between Bldgs 123 and 460 at SE corner	Monitor groundwater quality downgradient from IHSS 121 and PACs

4 2 Well Design and Installation

4 2 1 Well Design

The type of monitoring wells selected for installation at Building 123 are small diameter well points that are suitable for monitoring shallow (<20 foot depth) water-bearing zones These well points will have screens set in the uppermost 10-foot section of the saturated zone to detect for lateral migration of contaminants, based on the apparent limited use of dense non-aqueous phase liquids (DNAPLs) at the facility and depth limitations of the Geoprobe A screened interval of 6 to 16 feet is selected for all wells to account for seasonal fluctuations in water table depth, which is assumed to exist at a base level of about 6 to 7 feet below ground surface Final depth determinations will be made in the field based on actual drilling and initial depth to water results

All wells will be installed using conventional single casing construction methods described in GT 06, *Monitoring Well and Piezometer Installation* Typical well construction materials will consist of 0 75 inch inner diameter (ID), schedule 40 or 80 polyvinyl chloride (PVC) riser and factory cut (0 010-inch slot width) well screen Protective casing consisting of 2-inch ID steel riser with locking cap and lock will be set in sackrete to a depth of about 1 foot Flush-mount protective casings may be required to avoid damage in the heavily trafficked areas around Building 123 and will be installed on a case-by-case basis

Although the small diameter of these wells precludes the installation of dedicated monitoring devices for low-flow rate sampling purposes, the wells should provide for the collection of groundwater samples that are comparable in quality to larger-diameter RFETS monitoring wells sampled with a bailer Low-flow rate sampling using non-dedicated equipment may be possible for certain analytes provided that well yields are sustainably high It is expected that these monitoring wells will be limited to a servicable life of a few years for D&D monitoring purposes only

4 2 2 Pre-Drilling Activities

Before advancing boreholes, all locations will be cleared in accordance with GT 10, *Borehole Clearing*, and marked in accordance with GT 39, *Push Subsurface Soil Sampling* A prework radiological survey will be conducted in accordance with FO 16, *Field Radiological Measurements* All necessary Health and Safety protocols will be followed in accordance with the *Building 123 Decommissioning Project Health and Safety Plan* (RF/RMRS-97-022) and addendums, as appropriate

4 2 3 Borehole Drilling and Logging

Boreholes will be drilled using push-type techniques (Geoprobe) at all proposed well locations Detailed drilling and sampling procedures using this methodology are provided in GT 39 If probe refusal is encountered before reaching the target borehole depth, the borehole will be abandoned using procedure GT 05, *Plugging and Abandonment of Boreholes*, and an offset boring will be attempted within 3 feet of the original boring Where pavement exists at a wellsite, a pre-cut opening will be removed before drilling starts

Soil cores will be recovered continuously in two-foot increments using a 1-inch diameter by 24-inch long stainless steel- or lexon-lined California core barrel Following recovery, cores will be monitored with a Flame Ionization Detector (FID) or a Photoionization Detector (PID) in accordance with Site Procedure 5-1000-OPS-FO 15, *Photoionization Detectors and Flame Ionization Detectors,* for health and safety purposes The core samples will then be boxed and logged in accordance with GT 01, *Logging Alluvial and Bedrock Material,* except that logging will be conducted more qualitatively than specified in GT 01 (i e , sieving, microscope examination, and plasticity testing will not be conducted) All core boxes will be labeled and transferred to an ER core storage conex for archiving following project completion

4 5 Sample Collection

Prior to sample collection, the water level will be measured according to GW 01, *Water Level Measurements in Wells and Piezometers*, to determine purge water requirements During the initial sampling round, water level measurements will also be taken from the following existing wells to aid in potentiometric map construction for the interpretation of groundwater quality data

P415889	P416489	P115089	P114689	P218289	46492
P415989	P416589	P114989	P115689	68194	
P416089	P416689	P114889	P414189	68294	
P416189	P416789	P115489	P313489	68394	
P416289	P416889	P115589	P320089	68494	
P416389	P419689	P114789	P314289	4486	

Groundwater samples will be collected using the methods specified in GW 05, *Field Measurement of Groundwater Field Parameters*, and GW 06, *Groundwater Sampling,* as modified for small diameter well points Sampling procedures will be further modified for wells that prove to be incapable of yielding a full sample suite over the 3-day sampling period currently specified in GW 06, *Groundwater Sampling* These wells will be revisited and sample collection will continue past the third day as long as the well recharges sufficiently to warrant repeated sampling visits Low flow rate sampling methods will be implemented for metals and uranium isotopes if all wells prove to be capable of providing a sustainable yield of 100 ml/minute or greater with minimal drawdown, otherwise, sampling will be performed with a small diameter bailer After an initial sampling round is completed for all new wells, sampling of selected wells will be conducted on a semi-annual basis in support of D&D monitoring, as specified by the IMP (to be modified for Building 123 monitoring wells)

If necessary, a Health and Safety Specialist (HSS) or Radiological Control Technician (RCT) will scan each sample with a Field Instrument for the Detection of Low Energy Radiation (FIDLER) Equipment will also be monitored for radiological contamination during and after sampling activities All sampling equipment will be decontaminated with an liquinox solution, and rinsed with deionized or distilled water, in accordance with Environmental Management Department (EMD) Operating Procedure 5-21000-OPS-FO 03, *General Equipment Decontamination, Section 5 3 1, Cleaning Steel or Metal Sampling Equipment Without Steam in the Field* All other sampling equipment will include

Analysis	Matrix	No of Samples/ Event	EPA Method	Container	Preservation	Holding Time
Uranium Isotopes (U233/ 244 U235, and U-238)	Water	6	N/A[a]	1 (one) 1-liter poly bottle	Field filtered (0 45 μm membrane), HNO_3 to pH < 2	180 days
Am-241, Pu-239/240	Water	6	N/A[a]	1 (one) 4-liter poly bottle	Unfiltered, HNO_3 to pH < 2	180 days
Cs-137	Water	6	N/A[a]	1 (one) 4-liter poly bottle	Unfiltered, HNO_3 to pH < 2	180 days
Rad Screen	Water	6	N/A[a]	1 (one) 125 ml poly bottle	Unfiltered	180 days

[a] No EPA-approved method is currently in place for radionuclide analyses However, guidance is provided in procedures defined in Environmental Monitoring Support Laboratory (EMSL)-LV 0539-17, *Radiological and Chemical Analytical Procedures for Analysis of Environmental Samples*, March 1979

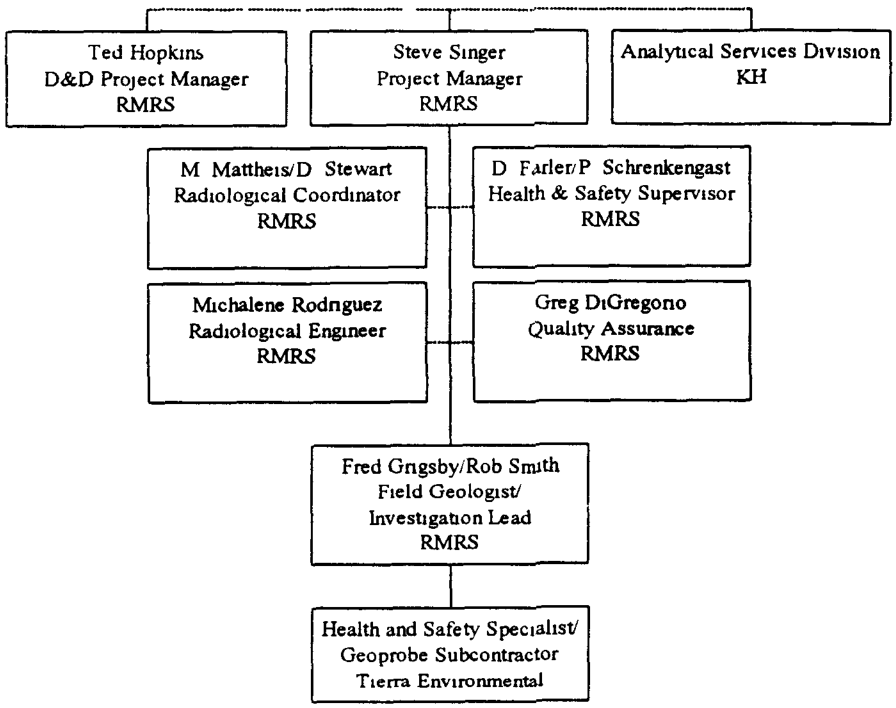
4 7 Equipment Decontamination and Waste Handling

Reusable sampling equipment will be decontaminated in accordance with procedure FO 03, *Field Decontamination Procedures* Decontamination waters generated during the project will be managed according to procedure FO 07, *Handling of Decontamination Water and Wash Water* Geoprobe equipment will be decontaminated following project completion using procedure FO 04, *Decontamination of Equipment at Decontamination Facilities* Personal protective equipment will be disposed of according to FO 06, *Handling of Personal Protective Equipment*

5.0 DATA MANAGEMENT

A project field logbook will be created and maintained by the project manager or designee in accordance with Site Procedure 2-S47-ER-ADM-05 15, *Use of Field Logbooks and Forms* The logbook will include time and date of all field activities, sketch maps of sample locations, or any additional information not specifically required by the SAP The originator will legibly sign and date each completed original hard copy of data Appropriate field data forms will also be utilized when

Figure 6 1
Building 123 Hydrogeologic Characterization Organization Chart



7.0 QUALITY ASSURANCE

All components and processes within this project will comply with the RMRS Qualify Assurance Program Description RMRS-QAPD-001, 1/1/97, which is consistent with the K-H Team QA Program The RMRS QA Program is consistent with quality requirements and guidelines mandated by the EPA, CDPHE and DOE In general, the applicable categories of quality control are as follows

- Quality Program,
- Training,
- Quality Improvement,
- Documents/Records,
- Work Processes,
- Design,

Analytical data that is collected in support of the Building 123 Soil SAP will be evaluated using the guidance developed by the Rocky Flats Administrative Procedure 2-G32-ER-ADM-08 02, *Evaluation of ERM Data for Usability in Final Reports* This procedure establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters

A definition of PARCC parameters and the specific applications to the investigation are as follows

<u>Precision</u> A quantitative measure of data quality that refers to the reproducibility or degree of agreement among replicate or duplicate measurements of a parameter The closer the numerical values of the measurements are to each other, the lower the relative percent difference and the greater the precision The relative percent difference (RPD) for results of duplicate and replicate samples will be tabulated according to matrix and analytical suites to compare for compliance with established precision DQOs Specifications on repeatability are provided in Table 5-2 Deficiencies will be noted and qualified, if required

<u>Accuracy</u> A quantitative measure of data quality that refers to the degree of difference between measured or calculated values and the true value of a parameter The closer the measurement to the true value, the more accurate the measurement The actual analytical method and detection limits will be compared with the required analytical method and detection limits for VOCs and radionuclides to assess the DQO compliance for accuracy

<u>Representativeness</u> A qualitative characteristic of data quality defined by the degree to which the data absolutely and exactly represent the characteristics of a population Representativeness is accomplished by obtaining an adequate number of samples from appropriate spatial locations within the medium of interest The actual sample types and quantities will be compared with those stated in the SAP or other related documents and organized by media type and analytical suite Deviation from the required and actual parameters will be justified

<u>Completeness</u> A quantitative measure of data quality expressed as the percentage of valid or acceptable data obtained from a measurement system A completeness goal of 90% has been set for this SAP Real samples and QC samples will be reviewed for the data usability and achievement of internal DQO usability goals If sample data cannot be used, the non-compliance will be justified, as required

<u>Comparability</u> A qualitative measure defined by the confidence with which one data set can be compared to another Comparability will be attained through consistent use of industry

9.0 REFERENCES

Ashtech, 1993, *Ashtech XII GPS Receiver Operating Manual, Version 7*

DOE 1992a, *Final Phase I RFI/RI Work Plan for Operable Unit 9, Original Process Waste Lines*

DOE 1992b, *Final Phase I RFI/RI Work Plan for Operable Unit 13, 100 Area, October*

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EG&G, 1994, *Technical Memorandum No 1, Investigation of Foundation Drains, Operable Unit 8, RFP/ERM-94-00011, Rev 0*

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EPA 1994, *Guidance for Data Quality Objectives Process, EPA QA/G-4, September*

RMRS 1997a, *Proposed Action Memorandum for the Decommissioning of Building 123*, May

RMRS 1997b, *RMRS Quality Assurance Program Description, RMRS-QAPD-001, Rev 1, January*

RMRS 1997c, *Final Sampling and Analysis Plan for the Pre-Remedial Investigation of the Mound Site Plume, February*

RMRS 1997d, *Soil Sampling and Analysis Plan to Characterize Individual Hazardous Substance Sites (IHSSs) 121 and 148 at Building 123, RF/RMRS-97-023, Revision 1, May 14, 1998*

RMRS, 1997e, *1996 Annual Rocky Flats Cleanup Agreement (RFCA) Groundwater Monitoring Report for Rocky Flats Environmental Technology Site, RF/RMRS-97-087 UN, November*

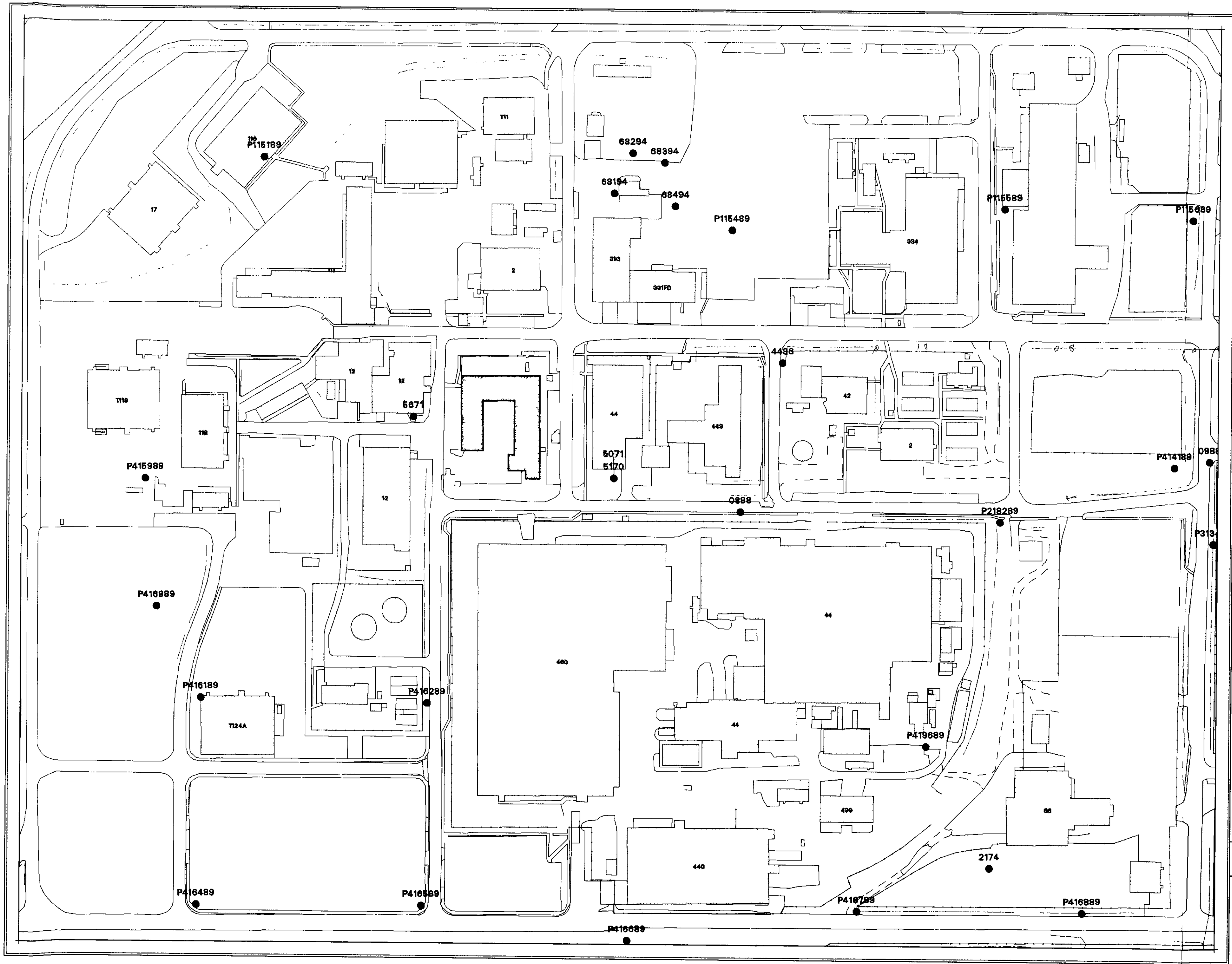

Figure 1 3

Building 123 Monitoring Well Locations

- Groundwater Monitoring Well
- Abandoned Groundwater Well

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams ditches or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads

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U S Department of Energy
Rocky Flats Environmental Technology Site

Prepared by

RMRS Rocky Mou tal Remediation Services, L.L.C.

MAP ID 98-0189

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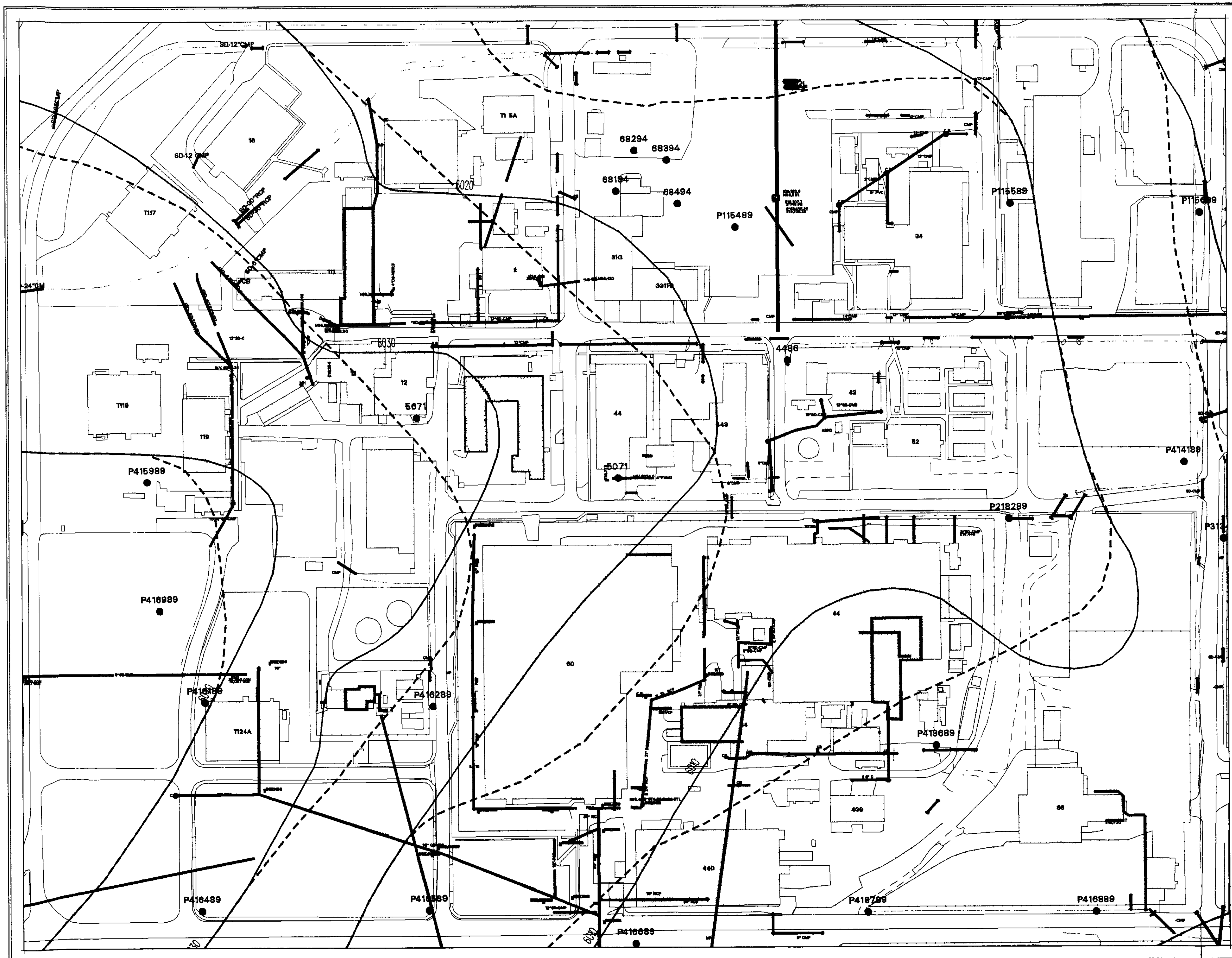

Figure 1-4

Building 123 Hydrogeological Characteration

Potentiometric Surface of Unconsolidated Surficial Deposits

(Second Quarter 1996 Data)

- Groundwater Monitoring Well
- Revised Water Level Contours (this report)
- Orig nal Water Level Contours (RMRS 1997e Plate 2)
- Foundation Drains
- Storm Drains

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams ditches or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads

DATA SOURCE
Foundation Dr at digitized from Hydrogeologic aracterization Repo Plate 3 ildin Footprint Foundat on Drain and Groundwater Diversion/Extraction System Map, pril 996 (Stoller C rp.)
Storm Drai age System converted from G ecifit Engineerin CAD dr wing file (DXF) 1993. The cation drainage system lines should only be use for general lo at on information Th formation as NOT ndergon QA/QC for accuracy or completeness.
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J ly 22, 1998